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THE IRON AND STEEL INDUSTRY OF JAPAN AND JAPANESE CONTINENTAL POLICIES

Political policies are usually shaped by economic forces. They may be, and in most cases are, the resultant of several industrial influences working toward certain general but often ill-defined ends. Not infrequently, however, a single industry or class of industries may be the sole or main determinant of political action. The power of such an industry in shaping a political program generally results from either its great predominance over all other interests or its importance in relation to national defense. Indications point to the latter influence as the dominant factor in certain phases of trans-Pacific politics.

The iron and steel industry of Japan is closely bound up with that country's continental policies. Military power is dependent upon this industry, and the political situation in the Orient will be better appreciated as the conditions governing Japan's iron and steel industry are understood. The mainspring behind this branch of manufacture is the government itself. This close association between political authority and the manufacture of iron and steel, due to the obvious relationship of the industry to the development of a military establishment, grew out of a similar relationship between the manufacture of arms and the old oligarchical government which existed in the feudal times of Japanese history.

One difficulty in the study of this industry in the Orient is the fragmentary and uncertain data available. Published statements are often little more than guesses based upon superficial observations and imperfectly compiled government statistics. The latter are frequently not clear as to the kind of material and areas covered. This is especially true of production statistics. Figures therefore must be quoted with considerable reserve.

Official statistics, however, of great value and reliability exist with reference to imports, exports, and a part of the iron and steel output. In some instances figures are published concerning both the capacity and output of individual works and mines. Of considerable importance in determining the true situation of the Japanese iron and steel industry are geological surveys which have been made concerning the iron ore and coal reserves of Eastern Asia—tolerably complete for Japan and Korea, but rather fragmentary for China. From these sources fairly reliable data are obtainable for forming some estimate of the position of the country with respect to the manufacture of iron and steel and its significance in connection with Japanese continental policies.

THE GENERAL SITUATION

Japan proper is far from being self-sufficient in the essentials of iron and steel manufacture as carried on under modern conditions. The annual production of pig iron amounts to only a few hundred thousand tons, and the major part of this iron is smelted from foreign ores. The steel output is appreciably greater, and is likewise largely manufactured out of imported pig iron and scrap. While Japan exports more coal than it imports, the native coal is not generally suitable for coking purposes, and hence the country is dependent upon foreign sources for its supply of coke and coking coal. In certain raw materials used in the production of alloy steel, like chromite, Japan is moderately well endowed. In the great basic materials, however, which are necessary for a large tonnage output its natural resources are limited.

The consumption of steel in Japan vastly exceeds its production, and hence much steel is imported. The greater part of this imported material comes in the forms of steel plate and steel bars, rods and structural shapes. These forms are used largely in the building of ships, although much of this and similar material is employed in other industrial lines.¹

The large importation of iron ore, coking coal, and pig iron shows that at the present time the steel industry of Japan

¹ Figures regarding production and imports are given below.

rests upon a rather unstable basis. The dependence of the country upon foreign steel also indicates that the handicap of inadequate supplies of native raw material is sufficient to keep the cost of steel manufacture at a relatively high point. Notwithstanding these drawbacks, the Japanese iron and steel industry has shown considerable progress during the past two decades and especially during the world-war. The largest producer in the country is the Imperial Steel Works located on the island of Kyushi near the ports of Wakamatsu and Moji. These works are owned and operated by the Japanese government. In addition to this government enterprise are several independent concerns—most of them small and devoted to the manufacture of foundry products, but a few of considerable size and engaged in producing tonnage¹ steel.

By far the greater part of the Japanese output of steel, and probably of pig iron, is manufactured in Japan proper. In recent years, however, there has been some movement of Japanese steel plants and foundries to the continent. While the present industrial depression has called a halt to this tendency, it is not improbable that in the near future this movement will again proceed. It is this development and the conditions producing it which are so significant for the politics of the Far East. A proper presentation of the iron and steel situation in Japan in its economic and political relations includes a consideration of the iron-ore and coal resources of Japan, Korea, Manchuria, and China proper, the production and consumption of iron and steel in Japan, the organization of the Japanese industry, and the Japanese "sphere of influence" on the Asiatic continent.

IRON-ORE AND COAL RESOURCES

The development of the iron and steel industry of any country is intimately related to the extent and character of its

¹ The term "tonnage" in the steel trade signifies large-scale or mass production. Tonnage steel includes such products as rails, structural shapes, plates, black sheets, wire rods, and the like, and is distinguished from high-grade carbon and alloy steel, which is used in the manufacture of high-priced cutlery, watch springs, expensive machine parts, and similar articles. The former is usually sold and quoted by the ton, and the latter by the pound.

iron-ore and coal reserves or those of adjacent territories. Cost of transportation is an important item in the expense of manufacturing pig iron wherever any considerable haulage is necessary in the assembling of raw material. Hence the production of iron and steel on any large scale must take place in regions not too remote from ample supplies of ore and coal.

The iron-ore and coal resources of the greater part of Eastern Asia are still very imperfectly known. In the case of Japan and Korea geological surveys have been fairly thorough, particularly in that of the former. The same can now be said, though to a less extent, of southern Manchuria. Except in a few regions where mining operations permit geological surveys in China have been much less carefully made.

The Executive Committee of the eleventh International Geological Congress, which met in Stockholm, Sweden, in 1910, prepared a report dealing with the iron-ore resources of the world. This report is still the basis used for estimating the reserves of different countries, although later geological surveys have in many instances altered the earlier figures. The estimates given in the report for Japan, China, and Korea are shown in Table I:¹

TABLE I
IRON-ORE RESOURCES OF JAPAN, CHINA, AND KOREA

Country	Variety of Ore	Actual Ore Supplies* (in Million Tons)	Equivalent Metallic Iron (in Million Tons)	Potential Ore Supplies*
Japan.....	{Magnetite Hematite Limonite}	55.6	28.0	Moderate
China.....	{Hematite Magnetite Limonite}	100.0	60.0	Probably enormous
Korea.....	{Hematite Limonite}	4.0	2.0	Probably moderate

* The term "actual" is used to signify proved and commercially valuable ore. "Potential" is the word employed to designate ore supplies which under present conditions cannot be profitably exploited because of low iron content, unfavorable location with respect to means of transportation, or deleterious ingredients. In the case of the three countries mentioned "potential" is also applied to deposits known to exist but not yet surveyed.

The foregoing estimates have not been changed materially, so far as Japan is concerned, since the report was published.

¹ International Geological Congress, *Iron Ore Resources of the World*, I, lxxviii.

It will be seen that Japan was credited with actual or commercially valuable iron-ore reserves amounting to 55,600,000 tons. In an ordinary good year the iron-ore production of the United States amounts to more than 60 million long tons,¹ and hence the Japanese reserves of commercially valuable iron ore are less than one year's output in this country.

The iron-ore reserves of China are still very imperfectly known. In many localities of this country iron ore is mined under primitive conditions. In the case of most other metals it has been found by experience that only those localities which have been previously worked by natives are likely to prove of value when developed on a more modern scale, and consequently a complete knowledge of the native workings may be assumed to cover the larger part of what is likely to prove of value in the future. The converse of this statement is true with respect to iron ore. When it comes to establishing modern blast-furnace plants it is likely to appear that the fuel suited to primitive methods is not suited to blast-furnace practice, and the ores of which a few tons at most were extracted daily with prodigious labor are neither of requisite richness nor sufficiently abundant to meet the new demands upon them. Hence, the modern iron industry is likely to develop in regions independent of its fore-runners.

Estimates of the actual iron-ore reserves of China, if made to-day, would in all probability greatly exceed those of the eleventh session of the International Geological Congress. A very large allowance, however, would still have to be made for potential supplies. In the report of the Congress no estimate of the actual ore reserves of Manchuria is given distinct from those for China as a whole. Recent estimates of these reserves range from 80 million to 250 million tons, but these figures, especially the latter, include much that would be designated in the above-mentioned report as "potential" supplies.

The figures given for Korea are smaller than the "actual" deposits now known. In recent years Korea has been supplying Japan with ores ranging in amount from 150,000 to 350,000

¹ *Annual Statistical Report of the American Iron and Steel Institute*, 1920, p. 58.

metric tons annually. In addition there has been a not inconsiderable consumption of ore in blast furnaces within the country itself. The iron-ore reserves of Korea, while larger than the estimates of a decade ago, are limited compared with those of Manchuria and certain provinces of China.

The principal iron-ore deposits now being worked in Japan are in the northern and central parts of the island of Honshu and the southwestern part of Hokkaido (formerly called Yezo) near the shores of Volcano Bay. By far the largest deposit in the empire is that of Kamaishi in the province of Rikuchu. This deposit was estimated by the International Geological Congress of 1910 to amount to 47,428,731 metric tons, all magnetite. Hematite deposits estimated at about four million tons exist in the provinces of Rikuchu and Echigo. Ores in the forms of limonite and iron sand also exist in the empire, but the former are in very limited amounts.¹

In China iron ores have been mined in large amounts at points along the Yangtze River. At Hanyang just across the Han River from Hankow, in the province of Hu-peï in the central part of the country, is located the plant of the Han-Yeh-Piang Iron and Steel Company, whose principal ore properties are located at Tai-Yeh, some fifty miles to the southeast and about fifteen miles west of the Yangtze River. The ores mined by this concern are hematites of high grade (containing from 60 to 62 per cent metallic iron). In the Kiang-Su province iron ores are widely distributed, occurring chiefly in the region about Nanking in association with limestone. In general chemical and physical character these ores are much like those of Tai-Yeh.² The fact that the ores in both these regions are conveniently

¹ International Geological Congress, *Iron Ore Resources of the World*, II, 927-65. See especially pp. 931-33. The terms magnetite, hematite, and limonite represent certain chemical and mineral differences in iron ore. While in chemical composition magnetite is the purest form of iron ore, many available ores carry sulphur, phosphorus, titanium, and other elements which limit their usefulness. Hematite (red hematite) constitutes the bulk of the iron ore of the United States, and is the principal ore from which steel is made. Limonite is a term used to cover hydrated hematites. Few of these ores are sufficiently free from phosphorus to be within the Bessemer limit, necessary for high-grade steel.

² International Geological Congress, *Iron Ore Resources of the World*, II, 915-24.

adjacent to the Yangtze River facilitates shipment to Japanese steel works, a large part of the Japanese importations coming from this section.

Iron ores, largely hematite, are found in the provinces of Chihli, Shansi, and Shantung. Large ore deposits also exist in Manchuria, although several of these contain ores of low grade which can be profitably smelted in this region on account of the close proximity of good coking coal but cannot be profitably shipped to Japan. Indications point to large ore reserves in Mongolia, but in the absence of good transportation facilities and because of their location little definite information is obtainable concerning their extent.¹

In Korea the iron ores are chiefly limonite. There are, however, some deposits of hematite and magnetite. The workable deposits average about 50 per cent metallic iron and are readily mined. While not enormous in amount they are capable of supplying the Imperial Steel Works of Japan and blast furnaces in Korea itself for several years to come.

In the manufacture of steel, coal is important. The consumption of coal in the manufacture of steel in its more advanced forms will often amount to three or four times the weight of the steel itself. In the manufacture of pig iron the amount of coal in the form of coke is approximately equal to the pig iron produced. In other words in producing a ton of pig iron two tons of high-grade iron ore (metal content approximately 50 per cent) and one ton of coke are ordinarily used.

The coal employed in the manufacture of both pig iron and steel is generally bituminous. It is bituminous coal out of which coke is manufactured. Not all kinds of bituminous coals are good coking coals. Whether or not a coal is good coking coal depends partly upon its chemical constituents and partly upon its physical properties. The coal generally employed in blast furnaces and steel works at the present time is coal belonging to the Paleozoic and Mesozoic deposits. More recent deposits of coal are usually of a sub-bituminous or lignite variety and are not generally suitable for coking purposes and often not for steel manufacture.

¹ *Ibid.*, pp. 915 ff.

In 1913 the International Geological Congress made an estimate of the coal reserves of the world similar to that made of iron ore in 1910. The coal resources of Japan, China, Korea, and Manchuria were estimated by that body as follows:¹

TABLE II

COUNTRY	ACTUAL RESERVES (IN MILLION TONS)			PROBABLE RESERVES (IN MILLION TONS)			TOTAL
	Class of Coal						
	A	B and C	D	A	B and C	D	
Japan	5	C 896	67	57	6,234	711	7,970
China (proper) ..	8,883	9,783	.....	378,581	597,740	600	995,587
Korea	7	I	5	33	{B 4 C 9}	22	81
Manchuria		{B 31 C 378}	.....	68	{B 223 C 508}	.....	1,208

In the foregoing tabulation the coal is divided into four general grades, A standing for anthracite, B for high-grade bituminous, C for low-grade bituminous and sub-bituminous, and D for lignite or brown coal. The figures for the "actual" and "probable" reserves are estimates based upon the degree of exactitude in making measurements. Thus "actual" reserves include all deposits in which the calculations of the amount are based upon a knowledge of the actual thickness and extent of the coal seams, while the "probable" reserves include deposits of which only an approximate estimate can be made.

The coal supply of Japan was estimated by the International Geological Congress at 7,970,000,000 metric tons. In addition to this amount there are other possible reserves of which no estimate has yet been made. There is practically no coal in Japan belonging to the Paleozoic era and only a small amount assigned to the Mesozoic (mostly Triassic and Cretaceous). The great bulk of the Japanese coal is Tertiary, chiefly Miocene. This material is only to a limited extent suited for iron and steel manufacture, and practically none of it makes good coking coal. While Japan exports more coal than it imports, the country is

¹ International Geological Congress, *The Coal Resources of the World*, I, xxx and xxxi.

obliged to rely in large measure upon foreign product for smelting and steel-making purposes. This coal comes mainly from Northern China and Korea.¹

Coal is widely distributed over China. The greater part of the known Chinese reserves are in two extensive areas, one in Northern China covering a large percentage of the province of Shansi and the other in the south extending over southern Hunan, Kueichou, Yunnan, and Szechuan. In addition to these large deposits there are other considerable supplies in the province of Chihli (in which Peking is located), in Shantung, and in other provinces.²

China is well supplied with both anthracite and high-grade bituminous coal. Much of the latter is excellent coking coal. Some of the deposits of China are at present rather inaccessible, but several are within the easy reach of Japanese iron and steel manufacturers. Among the coking-coal fields of China now largely subservient to the industry of the Island Empire are those of Pei-Piaw, located twenty-seven miles northeast of Chao-Yang; Fu Kai P'ing, about seventy-five miles northeast of Tientsin and served by a railroad; and Chiang-Hsing-Hsien, all in the province of Chihli; Yi Hsien, in the extreme south of Shantung; and Lien Chow, in the province of Kwantung. At the present time the coal fields of Chihli are the ones within China most likely to continue to supply Japan with coking coal.³

The coal-mining industry of Korea dates from a relatively remote period—even antedating that of Japan. The Phyong Yang field has been the principal seat of Korean production. Much of the coal mining is still conducted in a small way and by primitive methods. Most of the Korean coal belongs to the Mesozoic era and some of it is excellent coking coal.⁴

In Manchuria coal occurs in the Carboniferous, the Jurassic, and the Tertiary strata. Although there are great reserves of the first, the Fu-Shun Valley, which contains the most important mining area at present, is mainly Tertiary. Some of the thickest

¹ *Ibid.*, pp. liv, 281-347.

² *Ibid.*, p. xxx. See tabulation of reserves by provinces.

³ *Ibid.*, pp. lii, liii, 159-237.

⁴ *Ibid.*

coal seams of the world are located in Manchuria. The deposits now being worked do not supply much good coking material, but there is evidence of excellent coking coal in the Carboniferous deposits.¹

While iron-ore and coal deposits are the principal geographical factors in the development of the iron and steel industry, other resources influence the line of steel manufacture. The production of alloy steels is becoming more important each year, and from a military standpoint is essential in the manufacture of suitable and adequate ordnance material and equipment. Deposits of minerals used for the production of metal for alloying purposes will contribute to the growth of alloy-steel manufacture.²

Japan has some manganese ores, and in 1918 mined over 54,000 gross tons of this material. There are also deposits of molybdenite and tungsten-bearing ores. The country's output of the latter in 1918 was over 600 gross tons. Japan's situation, too, with respect to the newly opened-up deposits of tungsten-bearing ores in China practically assures producers of "high-speed steel" in the Island Empire abundant raw material. Chrome ore, or chromite, also exists in appreciable quantities. As a result of natural resources and situation the manufacture of alloy steels has progressed to a considerable extent in Japan.³

¹ International Geological Congress, *The Coal Resources of the World*, pp. liii, 239-97.

² Some of the most important of these alloying metals are manganese, chromium, tungsten, molybdenum, and vanadium. The first is essential in the manufacture of any steel made by the Bessemer or open-hearth process. It toughens steel, and when added in amounts of 12 to 15 per cent, contributes greatly to its wearing qualities. Chromium hardens steel and is used in the manufacture of armor plate, projectiles, and the like. Tungsten when added to steel in sufficient amounts—from 14 to 18 per cent—gives the metal the quality of maintaining its temper at red heat. This quality, useful in industrial life in the manufacture of parts for engines and other machine equipment, is of supreme importance in the rapid production of cannon and other war material. It is this "high-speed steel," as it is called, that made possible such a large consumption of ordnance material during the world-war. Vanadium and molybdenum increase the resistance of steel to repeated shock and are therefore much used in the manufacture of automobile steels.

³ *Thirty-fifth Statistical Report of the Department of Agriculture and Commerce, Japan*, p. 417.

Connected with the growth of alloy-steel manufacture is the utilization of water power. Most alloy steels are produced in electric furnaces, and the cost of hydroelectric power is a large item in the total expense of manufacture. While water power is not a raw material in the same sense that ores and coal are, it performs the same function in the operation of electric furnaces that coal and coke do in blast furnaces and steel works. Japan is well endowed with water-power resources and the utilization of hydroelectric power in the manufacture of high-grade carbon and alloy steels promises to be a feature of the further development of the steel manufacture of the country.

PRODUCTION AND CONSUMPTION OF IRON AND STEEL

As already indicated the statistics of iron and steel production in Japan are vague and not entirely consistent with published government trade data.¹ Speaking generally, however, the figures concerning output for Japan proper show a very limited iron-ore production, an annual pig-iron output ranging in recent years (1916-20) from less than 100,000 metric tons to about 500,000 tons, and a steel production varying from less than 300,000 to approximately 1,000,000 metric tons. The heavy importation of steel revealed by trade statistics shows that steel consumption is much greater than steel production.

The domestic output of iron ore in each of the years 1918 and 1919 amounted in round numbers to about 135,000 metric tons, or, more specifically, the metallic content of this ore was 82,010 tons in 1918 and 81,175 tons in 1919.² Considerably over 80 per cent of this production came from the mines of Kamaishi, in the province of Rikuchu.

The leading producers of steel in Japan rely wholly or for the most part upon imported ore. The Imperial Steel Works, the largest plant in the country, uses very little native ore. The

¹ The figures for iron ore are an exception to this statement.

² *Twentieth Financial and Economic Annual of Japan*, 1920, p. 54. The statistics are here given in terms of metallic (pig) iron. As the greater part of this ore was magnetite with a very high iron content the computation of ore tonnage is made on the basis of 60 per cent metal production.

imports of iron ore for the years 1917 to 1919, inclusive, by principal countries of origin, are as follows:†

TABLE III
IMPORTS OF IRON ORE INTO JAPAN PROPER, 1917-19

COUNTRIES	1917		1918		1919	
	Quantity (Metric Tons)	Value (Yen)	Quantity (Metric Tons)	Value (Yen)	Quantity (Metric Tons)	Value (Yen)
Korea.....	121,034	960,895	236,565	4,881,525	337,854	6,980,799
China.....	295,982	2,382,011	359,629	9,601,071	595,023	15,331,000
Kwantung province.....			180	2,000	5,459	205,000
Australia.....	1,140	73,000	1,020	69,000		
Philippine Islands.....					20,456	602,000
All Others.....	60	4,000	60	1,000		
Total.....	418,216	3,419,906	597,454	14,554,596	958,792	23,118,799

The total imports of iron ore, including those from Korea,² from 1917 to 1919, inclusive, amounted each year to several times the domestic production. In 1919 they were approximately seven times the home output. The great bulk of this ore comes from Korea and China. Nearly all the Chinese ore is shipped from the central part of the country—principally from the Yangtze Valley. Little or none is imported from Manchuria, which is known to have large deposits. Manchurian ore, however, will in all probability be smelted on the mainland, where the close proximity of coking coal will make blast-furnace operation more economical than in Japan proper.

With an annual domestic production of about 135,000 tons and imports in recent years from 400,000 to about 950,000 tons the annual consumption of iron ore in Japan ranges from a little over half a million tons to nearly 1,100,000 tons. As government figures show practically no exportation of iron ore and the iron content of the imported material would probably average not less than 50 per cent, the pig iron produced each

† *The 1919 Annual Return of the Foreign Trade of the Empire of Japan*, Part I, pp. 389 and 390 and Part II, p. 391. The iron-ore statistics are given in piculs in Japanese reports but are here reduced to metric tons. A picul equals 133½ pounds.

² For present purposes Korea (Chosen) is treated as foreign territory. In Japanese official publications Korea, of course, is made a part of the Empire of Japan.

year from this supply would range from about 250,000 to over 550,000 tons.¹ Government figures regarding pig-iron and steel production in Japan are much smaller than this assumed output.² It is fair to suppose that much of the iron and steel production of the country is not publicly reported.

Before discussing the pig-iron output and consumption some consideration should be given to coal. The use of coal in iron and steel manufacture is, of course, only one of several uses. It is, however, an important one. A recent estimate of the amount of coal required in this branch of the industry in Japan for the year 1920 to smelt a computed output of 377,616 tons of pig iron and make 1,031,550 tons of steel was 6,040,000 tons.³

The country's production of coal for the years 1917 to 1920, inclusive, was as follows:⁴

TABLE IV
PRODUCTION OF COAL IN JAPAN, 1917-20

Years	Quantity (Metric Tons)	Value (Yen)
1917.....	26,361,420	140,009,591
1918.....	28,029,425	286,032,425
1919.....	31,271,092	442,540,941
1920.....	29,245,384	418,075,754

As already stated, very little of the Japanese coal is suited for the manufacture of coke. Hence much coking coal and some coke are imported. The imports of coal and coke by countries for the years 1917-19 are shown in Table V on page 636.⁵

¹ The amount of iron ore used in the manufacture of certain chemicals, pigments, etc., is so small as not to affect this calculation. Furthermore, no allowance for metallic losses is required in present-day blast-furnace practice in the case of iron, as is necessary with many other metals.

² See below for published figures on pig-iron and steel output.

³ *Iron and Coal Trades Review* (London) (February 11, 1921), p. 207.

⁴ *Twentieth Financial and Economic Annual of Japan*, 1920, p. 52, and *Board of Trade Journal*, September 15, 1921.

⁵ *The 1919 Annual Return of the Foreign Trade of the Empire of Japan*, Part I, p. 388.

TABLE V
IMPORTS OF COAL AND COKE, 1917-19

	1917		1918		1919	
	Quantity (Tons)	Value (M. Yen)	Quantity (Tons)	Value (M. Yen)	Quantity (Tons)	Value (M. Yen)
Coal:						
China.....	485,693	5,438	534,512	9,615	463,298	11,251
Kwantung province	124,107	1,833	135,388	3,274	124,427	3,548
British India.....	4,030	40	.....	.....	150	3
French Indo-China	93,561	1,725	89,876	2,759	106,803	3,699
Asiatic Russia.....	.....	.....	4,552	107	4,962	84
Totals,* except						
Korea.....	707,421	9,038	761,698	15,763	699,646	18,588
Korea (Chosen)†..	123,812	1,006	107,762	2,047	89,023	2,672
Totals for coal, including Korea	831,233	10,044	869,460	17,810	788,669	21,260
Coke:						
China.....	44,162	1,310	74,799	3,011	24,271	1,191
Kwantung province	7,284	297	2,230	99	1,840	72
Total* for coke..	51,451	1,608	77,029	3,110	26,111	1,263

* Totals in Japanese trade figures are often larger or smaller than the sums of their items.

† In the *Financial and Economic Annals of Japan* the output of Japan does not include that of Korea, and hence the shipments from Korea to Japan proper are added in this table as imports.

The great bulk of the imported Chinese coal comes from the northern provinces. In the year 1919 out of a total of 463,298 metric tons (barring 124,427 tons imported from the Kwantung province) 423,988 tons came from Northern China. This last figure does not include the comparatively small importation of 37,030 tons derived from Manchuria.¹

The bulk of the imported coal is needed for metallurgical purposes, particularly blast-furnace operation and steel manufacture. It is significant that this imported fuel comes largely from regions where coking coal is mined.

Japan, while a large importer of coal, is a still larger exporter. In 1919 the exports of lump coal, excluding shipments to Korea, aggregated 1,686,621 tons, and those of coal dust 314,076 tons.² The coal shipments to Korea the same year amounted to 333,981 tons.³

The output of pig iron and steel is stated variously by different authorities, but all agree in giving a much larger

¹ *The 1919 Annual Return of the Foreign Trade of the Empire of Japan*, Part II pp. 32-33.

² *Ibid.*, Part I, p. 287.

³ *Ibid.*, Part II, p. 387.

tonnage to steel than to pig iron. The variation in the case of pig iron is partly accounted for by the practice of some authorities in Japan of tabulating as pig iron only that part of the product of the blast furnace which undergoes no further chemical change into steel or wrought iron. The pig-iron output in such cases is thus stated in terms of material destined for transformation into iron castings, but does not include the larger tonnage used in the manufacture of steel. This supposition, however, does not entirely clear up the ambiguity of government statistics. The differences in official statistics concerning steel production are quite as marked as in the case of pig iron.

The output of pig iron in Japan proper for the years 1913 to 1919, inclusive, as published by the most frequently cited official authority and supplemented by the figures of the London *Board of Trade Journal* for the year 1920, is as follows:¹

TABLE VI
PRODUCTION OF PIG IRON IN JAPAN (OFFICIAL FIGURES), 1913-20

Years	Quantity (Metric Tons)	Value (Yen)
1913.....	56,757	2,552,245
1914.....	74,179	2,742,223
1915.....	65,092	2,497,130
1916.....	86,157	4,601,808
1917.....	122,997	12,073,980
1918.....	181,246	38,091,576
1919.....	209,723	38,872,446
1920.....	168,729	19,882,076

The figures published by the Department of Agriculture and Commerce in Japan are somewhat smaller than those just tabulated, but the difference is not material.² The *Japan Year Book*, on the other hand, gives figures, based partly on estimates, greatly in excess of the two authorities cited. According to

¹ *Twentieth Financial and Economic Annual*, 1920, p. 280. The quantity of pig iron is given in the *Annual* in units of kwan (8.28 lbs.) which are reduced in the table to metric tons.

² *Thirty-fifth Statistical Report of the Department of Agriculture and Commerce of Japan*, 1918, pp. 416-17. An interesting feature of these figures is that they segregate the outputs of the Imperial Iron (Steel) Works and of independent concerns.

this publication the pig-iron output of Japan proper, Korea, Manchuria, and China for the years 1915 to 1919 is shown in the following table.¹

TABLE VII
PRODUCTION OF PIG IRON IN JAPAN AND CHINA, 1915-19, ACCORDING TO
THE *Japan Year Book*
(In Units of 100 Tons)

Years	Japan Proper	Korea	Manchuria	China	Total
1915.....	345.6	.....	30.0	200.0	575.6
1916.....	491.0	.....	35.0	200.0	726.0
1917.....	539.9	.....	70.0	200.0	809.9
1918.....	541.6	100.0	230.0	480.0	1351.6
1919.....	541.6	100.0	230.0	480.0	1351.6

In the foregoing tabulation the figures for the countries on the Asiatic mainland are obviously rough estimates. Those for China probably include the output of companies which are not entirely under Japanese control. It will be observed that the production of Japan proper is from two and one-half to over five times that given in the leading official publications.

Some years ago a financial and economic committee was appointed by the Japanese government to investigate the future development of the national iron and steel industry. This committee published a report containing the estimated output for the years 1920 to 1924, inclusive, as follows:²

TABLE VIII
ESTIMATED PRODUCTION OF PIG IRON IN JAPAN, 1920-24

Year	Tons
1920.....	377,616
1921.....	468,000
1922.....	437,000
1923.....	466,000
1924.....	492,000

The foregoing figures were based upon a careful study of the Japanese iron and steel industry and probably give a more

¹ *Japan Year Book*, 1919, 1920, pp. 561-62.

² *Iron and Coal Trades Review* (London, February 11, 1921), p. 207; *Commerce Reports* (July 7, 1921), p. 101.

accurate picture of the present-day production of pig iron in Japan than any other data available. Being much larger than the figures published by the ordinary government agencies above indicated they are more consistent with what we know of the character and amounts of the ore produced in Japan or imported from the Asiatic mainland without having the appearance of mere guesswork so characteristic of many given in current commercial journals.

In addition to the pig iron smelted from native and foreign ore there is a considerable tonnage of pig iron imported. Tabulated by countries this importation for the years 1917-19 is as follows:¹

TABLE IX
IMPORTS OF PIG IRON, 1917-19

COUNTRIES	1917		1918		1919	
	Quantity (Metric Tons)	Value (1,000 Yen)	Quantity (Metric Tons)	Value (1,000 Yen)	Quantity (Metric Tons)	Value (1,000 Yen)
China.....	109,747	9,337	157,716	41,814	95,171	16,287
Kwantung.....	26,985	4,572	24,877	8,378	62,773	11,717
British India.....	61,108	5,318	7,052	911	28,854	4,744
Great Britain.....	5,461	625	17,843	3,877	44,753	9,128
Sweden.....	3,745	708	4,216	1,034	10,782	2,761
United States.....	24,811	3,224	13,008	2,998	35,554	6,291
Australia.....					4,596	1,062
All Others.....	350	64	345	80	628	155
Total.....	232,207	23,848	225,057	59,092	283,111	52,145

It will be observed that during the three years mentioned Japan imported between 225,000 and 285,000 tons annually. Considerably over half came from China (including the province of Kwantung). As practically no pig iron is exported this material, added to the officially reported output, if government figures were reliable, would give the country's approximate consumption. As a matter of fact the actual consumption of pig iron in Japan upon the basis of published import figures for both iron ore and pig iron and the known production of native ore is considerably larger. In the year 1919, for example, with an assumed metallic content for native and imported iron ore which was probably

¹ *The 1919 Annual Return of the Foreign Trade of the Empire of Japan, Part I*, p. 290.

less than its actual amount¹ this raw iron exceeded by about 50,000 tons the combined pig-iron and steel output of Japan as reported in government figures. In addition there was an importation of 283,000 tons of pig iron.² It is evident that much of the iron produced in Japan, as has already been observed, is not reported.

Coming to steel there is a similar discrepancy between the government figures concerning output and the statistics regarding imports of iron ore and pig iron. The reported production of pig iron and steel, even assuming that in the official figures none of the former is included in the latter, is much below the metallic iron imported in the raw material. As in the case of pig iron ordinary government figures do not cover the entire steel output.

Table X shows the annual production of steel in Japan for the years 1913 to 1919, inclusive, as reported in the *Financial and Economic Annual of Japan*.³

TABLE X
PRODUCTION OF STEEL* IN JAPAN, 1913-19, ACCORDING TO
Financial and Economic Annual

Years	Quantity (Metric Tons)	Value (Yen)
1913.....	13,751	809,087
1914.....	15,412	864,758
1915.....	16,791	1,164,762
1916.....	305,583	46,251,283
1917.....	370,669	82,569,141
1918.....	334,014	113,619,943
1919.....	299,960	72,666,689

* In reporting the steel output of a country the production is stated in terms of ingots and castings—the crude furnace products out of which the more highly finished forms are made.

¹ The assumed percentage of metallic iron in the imported ore is 50 and that of the native ore 60. The former is probably as much as 10 per cent less than the actual iron content.

² When it is remembered that in steel manufacture, especially by the open-hearth process, much scrap is used (usually about 50 per cent) and that Japan has built several open-hearth furnaces in recent years (see *Iron Age* [October 21, 1920], pp. 1045 ff.) the discrepancy between the government trade figures and those for production becomes still more noticeable.

³ *Twentieth Financial and Economic Annual of Japan*, 1920, p. 52. The figures for quantity are reduced from kwan to metric tons.

The sudden increase in the steel output in 1916 is accounted for by the omission of the production of the Imperial Steel Works during the first three years above tabulated and its inclusion for subsequent years. In the statistical reports of the Department of Agriculture and Commerce the figures, while not identical with those above given, are substantially the same. These reports segregate the outputs of the Imperial Steel Works and independent producers.¹ Their incompleteness, however, is shown by the small production reported for independents, which constituted during the years 1913 to 1919 only about 5 to 8 per cent of the country's total, notwithstanding the fact that during the later years of the world-war the aggregate output of the independent steel makers probably approximated that of the Imperial Steel Works.

The Financial and Economic Committee, already referred to, made a forecast of steel production, similar to that of pig iron, which was greatly in excess of published government data. The forecast for the years 1920 to 1924 was as follows:²

TABLE XI

ESTIMATED STEEL PRODUCTION OF JAPAN, 1920-24	
Year	Tons
1920.....	1,031,550
1921.....	1,099,000
1922.....	1,164,000
1923.....	1,227,000
1924.....	1,287,000

These estimates are from three to four times the figures given in Japanese government documents for the years 1918 and 1919, and are doubtless nearer the present-day producing capacity of the empire than the official statistics.³

The consumption of steel in Japan is known to be much greater than the production. There is a small amount of steel

¹ *Thirty-fifth Statistical Report of the Department of Agriculture and Commerce of Japan*, pp. 416-17.

² *Iron and Coal Trades Review* (London, February 11, 1921), p. 207, and *Commerce Reports* (July 7, 1921), p. 101.

³ The business depression which spread over the world in the fall of 1920 began in Japan late in 1919. This depression has affected steel production to a very serious extent in Japan.

exported, principally to China, but importation is relatively heavy. Prior to the world-war Japan imported considerable amounts of steel from Germany and Great Britain. During recent years these imports have come mainly from the United States. The leading articles imported are shapes in the forms of bars, rods, tees, angles, rails, and the like, and plate or sheet iron (steel)¹ not coated with other metals. These imports for the years 1917 to 1919, inclusive, with the amounts furnished by the United States are shown in the following table.²

TABLE XII

IMPORTS OF BARS, RODS, AND STRUCTURAL SHAPES, AND PLATE AND SHEET IRON
(STEEL) NOT COATED WITH OTHER METALS, 1917-19

	YEAR	TOTAL IMPORTS		IMPORTS FROM UNITED STATES	
		Quantity (Metric Tons)	Value (1,000 Yen)	Quantity (Metric Tons)	Value (1,000 Yen)
Iron (steel) bars, rods, tees, angles, etc.....	1917	197,601	46,369	178,974	39,474
	1918	265,740	84,221	249,583	76,393
	1919	190,889	47,721	177,556	41,989
Plate or sheet iron (steel) not coated with metals...	1917	298,028	91,395	283,988	87,515
	1918	160,107	77,932	158,574	76,688
	1919	239,543	67,854	192,622	56,376

Excluding iron ore and pig iron the two groups of commodities tabulated constituted about two-thirds of the total iron and steel products imported into Japan. Other steel commodities brought in in substantial amounts from abroad are wire rods, tin plate, galvanized wire, and pipes and tubing. During the years 1917 to 1919, inclusive, approximately 90 per cent of the imported steel came from the United States.³

¹ In Japanese trade statistics steel is often designated as iron. Aside from pig-iron and cast-iron pipes the articles so designated, especially those coming from the United States, are almost entirely steel.

² *The 1919 Annual Return of the Foreign Trade of the Empire of Japan*, Parts I and II.

³ During the last two years there has been some falling off in this importation from the United States, but complete figures are not available from Japanese sources. This country, however, still continues to supply Japan with the greater part of its foreign steel. In 1920 the United States exported to Japan 89,839

While foreign iron and steel in trade statistics are grouped in classes according to uses and stages of manufacture, there are no available figures showing the home output by kinds or classes. It is known that a large part of the pig-iron production given in government statistics is made into castings of various kinds. The output of wrought iron in Japan is insignificant, amounting annually to less than 2,000 metric tons.¹ In the United States such iron is more expensive than ordinary carbon steel, and is now used principally in the manufacture of chains for vessels and of pipe exposed to more than ordinary corrosion. The steel production of Japan probably consists, in the main, of standard tonnage products like rails, billets, bars, structural shapes, plates, black sheets, tin plate, and wire. But the relative importance of these several groups is not shown in published reports.² Special steels (high carbon and alloy) are also manufactured, but no figures are available to show the extent of this production. As already indicated, Japan has certain advantages with respect to the raw materials entering into the manufacture of such steels.

How much of the steel production and importation goes into the manufacture of military and naval equipment it is impossible to say. Much of the steel plate imported from the United States in recent years has been utilized in the building of vessels for the rapidly growing mercantile marine of the empire. Other imported steel has also been put to industrial rather than to purely military or naval uses.³ A considerable part of the home-manufactured and a probably smaller proportion of the foreign

tons of structural iron and steel valued at \$6,295,271 and in 1921, 48,827 tons valued at \$4,745,857. The exports of steel plate in 1920 were valued at \$15,704,316 but in 1921 dropped to \$2,442,301 (*Monthly Summary of Foreign Commerce*, December, 1921).

¹ *Thirty-fifth Statistical Report of the Department of Agriculture and Commerce of Japan*, p. 416.

² The character of the steel products of Japan is indicated mainly by notices and reports of the building of certain kinds of mills and works.

³ One reason for this inference is the nature of the steel. The imported steel is mainly ordinary carbon steel, while steel for ordnance and naval purposes is largely nickel, chrome, and silicon steels.

material are doubtless destined for ordnance equipment and warship supplies. The military importance of the iron and steel industry, however, is not gauged by the proportion of product going into the making of guns, shells, armor plate, and the like. A large part of a war-time demand is for output which has industrial uses, as rails, barbed wire, tank and ship plate, silicon and tungsten steels, black sheets, and tin plate. Any nation wishing to conserve its military strength must have the support of a highly developed iron and steel industry.

The most significant feature of this branch of manufacture in Japan, as shown by the statistics concerning output and commerce, is its dependence upon foreign supplies. As already indicated, China and Korea furnish the bulk of the iron ore and coking coal. The extent of this dependence may be shown with some degree of precision in the case of iron ore by a comparison of the domestic production and imports for the years 1918 and 1919.

TABLE XIII
COMPARISON OF DOMESTIC PRODUCTION AND IMPORTS OF IRON ORE,
JAPAN, 1918 AND 1919

	1918 (Metric Tons)	1919 (Metric Tons)
Domestic production*.....	136,838	135,292
Imports (total).....	597,454	958,792
Imports from China (including Kwantung) and Korea†.....	596,374	938,336

* As already stated, the iron content of the Japanese ore is assumed to be 60 per cent. The output of native ore is given in government statistics in terms of metallic content only, and hence has to be transformed into units comparable to those of the imported material.

† It will be remembered that Korea, for purposes of this article, is treated as foreign territory, although politically it is now a part of the Japanese Empire and as such bears the name of Chosen.

In 1918 the imported iron ore was over four times, and in 1919 about seven times, the domestic production, and consisted almost entirely of Chinese and Korean material. In addition to this dependence upon Chinese and Korean ore is the large importation of coal and coke used for metallurgical work, aggregating in recent years over 750,000 tons annually.

In view of the ambiguity of published figures concerning the pig-iron and the steel output of the country, comparison

may be made between the total production of pig iron and steel, as reported in government documents, and the total imports of iron and steel. As much of the steel importation comes from the United States, the figures for this country may also be stated. In units of quantity and value for the years 1918 and 1919 this comparison is shown as follows:

TABLE XIV

COMPARISON OF JAPAN'S OUTPUT OF PIG IRON AND STEEL WITH TOTAL IMPORTATION OF IRON AND STEEL PRODUCTS AND WITH IMPORTS FROM THE UNITED STATES, 1918 AND 1919

	1918		1919	
	Quantity (Metric Tons)	Value (Yen)	Quantity (Metric Tons)	Value (Yen)
Japan's output of pig iron...	181,246	38,091,576	209,723	38,872,446
Japan's output of steel.....	334,014	113,619,943	299,960	72,666,689
Total output of pig iron and steel.....	515,260	151,711,519	509,683	111,539,135
Total importation of pig iron and steel*.....	913,085	300,040,000	918,780	223,341,000
Ratio of imported iron and steel to domestic pro- duction in percentage	177.2	197.8	180.6	209.2
Imports from the United States.....	587,856	220,392,000	567,960	158,028,000
Percentages of imports from United States to total imports.....	64.38	73.45	61.79	67.72
Ratio of imports from the United States to domestic production in percentage.....	114.1	145.3	114.4	141.7

* A very small amount of iron imported principally from Asia is not included in this total.

The foregoing figures with reference to Japanese output and ratios of imported material to this output are based upon published government statistics. As there is apparently much pig iron and steel which is not accounted for in these publications the actual ratios of importation to production are smaller than the figures would indicate. Nevertheless, the table shows that Japan is dependent upon foreign countries for a large percentage

of its iron and steel. Making a liberal allowance for the home production not included in the government figures the ratio of imported iron and steel to domestic output would probably exceed 100 per cent. In other words, 50 per cent or more of Japan's consumption¹ is of foreign derivation.

Of the imported iron and steel the United States, during the years 1918 and 1919, furnished from 60 to 65 per cent of the quantity and from 67 to 74 per cent of the value. The ratio of American imports to domestic output as tabulated above ranged from 114.1 per cent in quantity to 145.3 per cent in value for the year 1918, and from 114.4 per cent in quantity to 141.7 per cent in value for the year 1919. These ratios, of course, would be materially reduced, under our assumption of a larger pig-iron and steel output than the government figures tabulated would indicate, but they would still be very large. If steel alone were considered the proportion of American to total imports would be materially larger, as the Japanese importation of American pig iron is comparatively small.

Roughly speaking the situation of Japan in 1918 and 1919 with reference to the consumption of iron and steel manufactured abroad or manufactured out of foreign material as compared with purely native metal may be indicated as follows:

TABLE XV

	1918 (Metric Tons)	1919 (Metric Tons)
Pig iron produced from domestic ores	82,101	81,175
Pig iron produced from imported ore including ore from Korea (estimated)	298,727	479,396
Imports of pig iron	225,057	283,111
Imports of crude, semi-crude and manufactured articles of iron and steel	688,847	635,669
Total approximate consumption of metallic iron of foreign origin*	1,212,631	1,398,176

* There is a small export of Japanese iron and steel to the Asiatic continent. While this would have to be subtracted from the total in order to bring it closer to actual consumption, it is not important for the purpose of showing how dependent Japan is upon foreign countries for the metallic iron utilized.

¹ Owing to possible duplication of product in moving from one stage of production to another, it is difficult to state Japan's consumption with any very great degree of precision. Furthermore, there is a small exportation of iron and steel principally to China. What is stated in the text, however, is substantially correct.

It will be seen from the figures given that the bulk of the metallic iron utilized in Japan, either as raw material for further manufacture or as finished articles for immediate consumption, is of foreign origin. Thus in 1919 out of an approximate total consumption of 1,479,351 metric tons¹ only 81,175 tons were mined in Japan. With respect to raw material—iron ore, coking coal, and to a considerable extent, pig iron—Japan proper is a dependency of China and Korea. With respect to crude and finished iron and steel the country is obliged to rely in large measure upon the leading steel-producing countries of the Western world.² It is this state of dependency of a key industry which is influencing Japan's political policies in the Orient.

ORGANIZATION OF THE IRON AND STEEL INDUSTRY IN JAPAN

The organization of the iron and steel industry in Japan has been shaped by two factors, a political policy and commercial environment. The first is responsible for the government's interest in the industry as shown by the organization of the Imperial Steel Works and the recently reported subsidies to independent producers. The second is responsible for a more or less pronounced movement toward an organization of the iron and steel industry on the mainland of Asia. The government's interest, as has been noted, is due to the close relationship

¹ The actual consumption is probably much greater than this, as much steel is made of remelted material. Under present metallurgical practice metals are often consumed several times. It should be noted in this connection that figures given for steel production often exceed the total metallic content of the ores and pig iron utilized in manufacture. This apparent statistical discrepancy is due to the use of scrap. In the manufacture of steel by the open-hearth process—the most common process now employed—about 50 per cent of the raw material consists of scrap. On the Pacific Coast of the United States as much as 85 per cent scrap is used.

² A recent announcement has been made of a discovery by which iron sand, which is abundant in Japan, can be utilized for the manufacture of steel. This discovery, it is stated, makes possible the country's independence of steel imports in case of need. Experiments were begun in September, 1920, with this iron sand with tolerably good results. Although the discovery is successful from a military point of view, the statement concludes that this does not necessarily mean that it insures any economic advantage over importation. See *Mining Journal* (London), October 23, 1921. Telegram, October 14, Reuter, Tokyo.

of this branch of manufacture to the military strength of the empire. The movement to the continent, which has been temporarily checked on account of the prevailing industrial depression, is determined by conditions of economy and markets. Coal and ore can be shipped at moderate expense by water to the islands of Kyushi, Honshu, and Hokkaido, but the cost of pig iron and steel would be materially reduced by locating blast furnaces and rolling mills nearer the coal and ore fields of the mainland.¹ The prospective markets, too, for tonnage products like steel rails, structural shapes, plates, sheets, and wire are greater in China and Manchuria than in Japan itself.

The published material with reference to the number and capacity of blast furnaces, foundries, steel works, and rolling mills is fragmentary and generally vague. The largest producer of iron and steel is the Imperial Steel Works located on the island of Kyushi near the ports of Wakamatsu and Moji. According to figures tabulated by the Department of Agriculture and Commerce for the year 1918, the government works produced between 90 and 95 per cent of the steel output of Japan and about 75 per cent of the combined pig-iron and steel production of the country.² These proportions, however, are probably greater than figures for actual present-day production would justify. A large number of independent companies have recently entered

¹ The significance of cheap assembling of material may be illustrated in the case of pig iron in the United States. According to the cost figures of five representative companies reporting to the Federal Trade Commission the "net metal" cost—chiefly ore—constituted, during the last three months of 1918, 51.73 per cent of the total furnace expense of manufacturing basic pig iron, and coke 33.14 per cent. This total expense did not include certain overhead charges like depreciation, amortization, and general office expenses which would probably have aggregated only about \$2 per ton. In computing the cost of iron ore for the year 1918 the Commission found that out of an average total expense of \$4.19 per ton when landed at the blast furnaces in the lower lake region—exclusive of general administrative and selling expenses—\$1.93, or 46 per cent of the total ore cost, consisted of rail and water charges. See *Tariff Information Surveys* FL-21, pp. 28 and 72. In Japan the haul of ore and coal from Asia is considerably greater than in the Great Lakes region of the United States.

² *Thirty-fifth Statistical Report of the Department of Agriculture and Commerce of Japan*, 1918, pp. 416-17.

the industry, and some of the older concerns have enlarged their plants. Some companies have furnaces and mills of considerable capacity and are apparently doing a flourishing business. Figures supplied from the *Japan Weekly Chronicle* by Mr. James F. Abbott commercial attaché at Tokyo, give in round numbers an estimated production, in terms of pig iron, for the year 1919, of 980,000 metric tons distributed among the leading manufacturers as follows:¹

TABLE XVI

	Metric Tons
Government Steel Works.....	400,000
Kamaishi Iron Mines.....	80,000
Hokkaido Steel Works.....	130,000
Hanyang Steel Works.....	100,000
Oriental Steel Works.....	30,000
Penchihi Steel Works.....	30,000
Anshan Steel Works.....	60,000
Kyonuko.....	100,000
Others.....	50,000
Total.....	980,000

It is to be noted that some of the companies above mentioned have their principal plants on the continent. The Anshan Steel Works and the Penchihi Steel Works are located in Manchuria, and the Hanyang Steel Works, in the province of Hupei, China, at the junction of the Han and Yangtze-Kiang rivers. Subtracting the estimated production of these manufacturers of the mainland from the total the aggregate output of the Government Steel Works is approximately 50 per cent of the total for Japan. It may, however, be stated in this connection that some of the larger of the new companies, like the Oriental Steel Works, expect to equal the government enterprises when pending extensions are completed.

Figures with reference to the capacity of iron and steel works distributed according to geographical location, have been compiled by the Department of Agriculture and Commerce of the empire. These figures are those for the present and future

¹ *Iron Age* (October 21, 1921), p. 1045.

capacity of steel works controlled by Japanese. Tabulated for the years 1918 to 1922-23 they are as follows:

TABLE XVII

	Steel				
	1918 (Metric Tons)	1919 (Metric Tons)	1920 (Metric Tons)	1921 (Metric Tons)	1922-23 (Metric Tons)
Japan	1,150,000	1,600,000	1,770,000	1,920,000	2,000,000
Korea (Chosen)	15,000	50,000	50,000	50,000	50,000
Manchuria			30,000	60,000	60,000
	Finished Steel Material				
	(Metric Tons)	(Metric Tons)	(Metric Tons)	(Metric Tons)	(Metric Tons)
Japan	810,000	1,140,000	1,260,000	1,400,000	1,490,000
Korea (Chosen)	14,000	40,000	40,000	40,000	40,000
Manchuria		20,000	50,000	50,000	50,000

The steel materials recorded in the second part of this table are derived from the steel listed in the first, and hence the two are not to be added. It should be remembered also that iron and steel capacity does not coincide with actual production. The figures here listed, however, are given as indicating certain estimates made of the geographical distribution of the iron and steel capacity of Japanese works. So far as actual production is concerned they probably have little real statistical value. They do show the movement of Japanese steel manufacture toward the continent—a movement likely to be more pronounced in the future than it has been in the past.

In a report published by Mr. Abbott some thirty-seven independent companies are named. Over half of these are small producers serving either a local trade or manufacturing highly specialized articles. Some, however, are concerns of considerable magnitude. In addition to the companies already mentioned as having plants on the continent are the Mitsubishi Steel Manufacturing Company with works on the west coast of Korea, and the Okura Mining Company operating in the province of Kiang-Su, China, about twenty miles from Nanking. In Manchuria the South Manchurian Railroad is under Japanese

control and is closely associated with the iron and steel development of the southern part of that province.

There is apparently a very close relationship between the larger independent steel manufacturing companies and the Japanese government. This relationship is shown by the control exercised by the banking interests of the country, which are themselves intimately associated with governmental policy. In all larger mining and manufacturing companies the banking interests virtually shape business policies. Furthermore, information has lately been received that the Japanese government has made advances of money to five of the important private iron and steel corporations of the country. Each of these five is to receive 10 million yen, approximately \$5,000,000. The recipients are the Hokkaido Iron (Steel) Works, the Oriental Steel Works (Toyo Seitsusu Kaisha), the Mitsubishi Steel Works, the Penchiho Iron Colliery Company and the Tenaka Mining Company. The reason assigned for this government subsidy is the slump in the value of pig-iron stock accumulated by these concerns.¹ It is worthy of note that the principal plants of two of these recipients are on the Asiatic mainland.

THE JAPANESE "SPHERE OF INFLUENCE"

On the Asiatic mainland Japan has absorbed Korea, making it an integral part of the empire. Manchuria, especially the part south of the Chinese Eastern Railroad, and extending over most of the territory to Korea Bay and the Gulf of Liatung, is practically governed by Japan, although nominally a part of China and under the jurisdiction of the officials at Peking. After the capture and occupation of Kiaochow following the outbreak of the world-war, the province of Shantung was also brought under Japanese control. At the recent Arms Conference held in Washington an agreement was reached by which this province will be restored to China. Japanese authority has to all appearances been definitely extended over the northern as well as the southern part of the island of Saghalien. In addi-

¹ *Ibid.*, p. 1045.

tion to these regions the political influence of the Island Empire is felt in Eastern Siberia especially about Vladivostok, in Mongolia east of the Great Khingan Mountains, and in the province of Chihli, both north and south of Peking and in the northeastern part of the province of Hunan.

Aside from southern Manchuria, Korea, and the Chinese provinces of Chihli, Shantung, and Hunan, all of which have been touched upon above in describing the raw-material resources of Eastern Asia, it is difficult to say anything definite respecting the reserves of iron ore and coal in this vast stretch of territory. It is commonly believed, however, that the iron-ore resources of Mongolia are great and that coal and ore deposits are extensive in the extreme east of Siberia, and throughout the island of Saghalien. Over the greater part of these more remote regions distance and lack of transportation facilities prevent utilization of whatever iron-ore or coal deposits they may possess. Much of Manchuria and Mongolia, even with up-to-date transportation facilities, is too far away from existing industrial centers for the economical shipment of such bulky commodities as iron ore or coal. If such resources are ultimately utilized in these regions, assuming their existence, they will probably be developed by companies whose plants are on the continent near enough to make the assembling of material more profitable than would be its shipment to Japan proper or to coastal points on the mainland.

It has already been seen that Northern China and Korea supply Japan with the bulk of the coal used there for metallurgical purposes, and that large deposits of this fuel exist in southern Manchuria. Much iron ore is also found in this region, but the Japanese manufacturers at present get the greater part of their supply of this material from places south of their country's "sphere of influence." The Yangtze Valley, as has already been observed, furnishes Japan with the greater part of its imported iron ore. Even here, however, Japanese interests are influential, as is shown by their control of the steel company at Hanyang. Recently there have been some attempts to establish a national government in this region of China, centering in the province of Hupei, similar to the governments at Peking

and Canton.¹ While there is much obscurity about these movements and it is hazardous to assume that they are in any way incited by Japanese steel interests, they do furnish a plausible ground for extending a political authority which is really impelled by an economic need. That this imperialistic penetration into a region endowed with great natural resources is an economic need is obvious to anyone believing in the necessity or desirability of Japan's maintaining a strong military establishment. Such an organization must be based upon an industry capable of supplying requisite materials. The country's own iron-ore and metallurgical-coal reserves are at best very meager, and the nearest country capable of supplying on any large scale the finished iron and steel required for industrial and military uses is over eight thousand miles away.

The economic wisdom of this imperialistic movement may of course be questioned, as similar developments have been in other countries. The extensive military establishment which generally accompanies such extensions of power does represent the withdrawal of much wealth or capital from more productive expenditure. How far this apparent waste is justified by the protection afforded and the indirect influences operating to further a better organization of industries in general is a matter of dispute. It is evident, however, that Japan feels that the maintenance of a strong military organization is essential. Such being the case, it is natural that the industrial basis of that organization should be developed in accordance with modern technique.

The iron and steel industry is doubtless only one of several economic influences shaping the political policies of the Island Empire in the Far East. It is, however, crucial. Much has

¹ The nominal president of Northern China is Hsu Shih Chang, whose capital is at Peking. President Sun Yat Sen rules at Canton with evidently a wider recognition of authority than is given to the northern executive. President Hsu is seriously handicapped for funds, and the northern government has been practically controlled by the *tuchun*, Chang Tso-lin, of Manchuria. Chang Tso-lin is reputed to have the backing of the Japanese government. See interesting article by J. O. P. Bland in the *Atlantic Monthly* of November, 1921, on "The Far Eastern Problem." At the present time (May, 1922) Chang Tso-lin is being opposed by another *tuchun*, Wu Pei-fu.

been made in popular discussion of the pressure of an increasing home population as the motive with Japanese statesmen in this policy of expansion. It is worthy of note, however, that the absorption of Saghalien and southern Manchuria has not been followed by any considerable migration of Japanese into these regions. Neither has this reported pressure of population resulted in any large movement toward the island of Hokkaido, which still has considerable fertile land unoccupied. Moreover, Korea, which has virtually been annexed to the empire, and the provinces of Chihli and Shantung, over which Japan exercises more or less political influence, were already densely populated when this imperialistic policy began to be exerted. Seen, however, in the light of the powerful support which the resources of these regions are capable of rendering a key industry in the political and military structure of the empire Japan's course on the Asiatic continent is readily explained.

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